

U.S. Department of Energy



Office of Science

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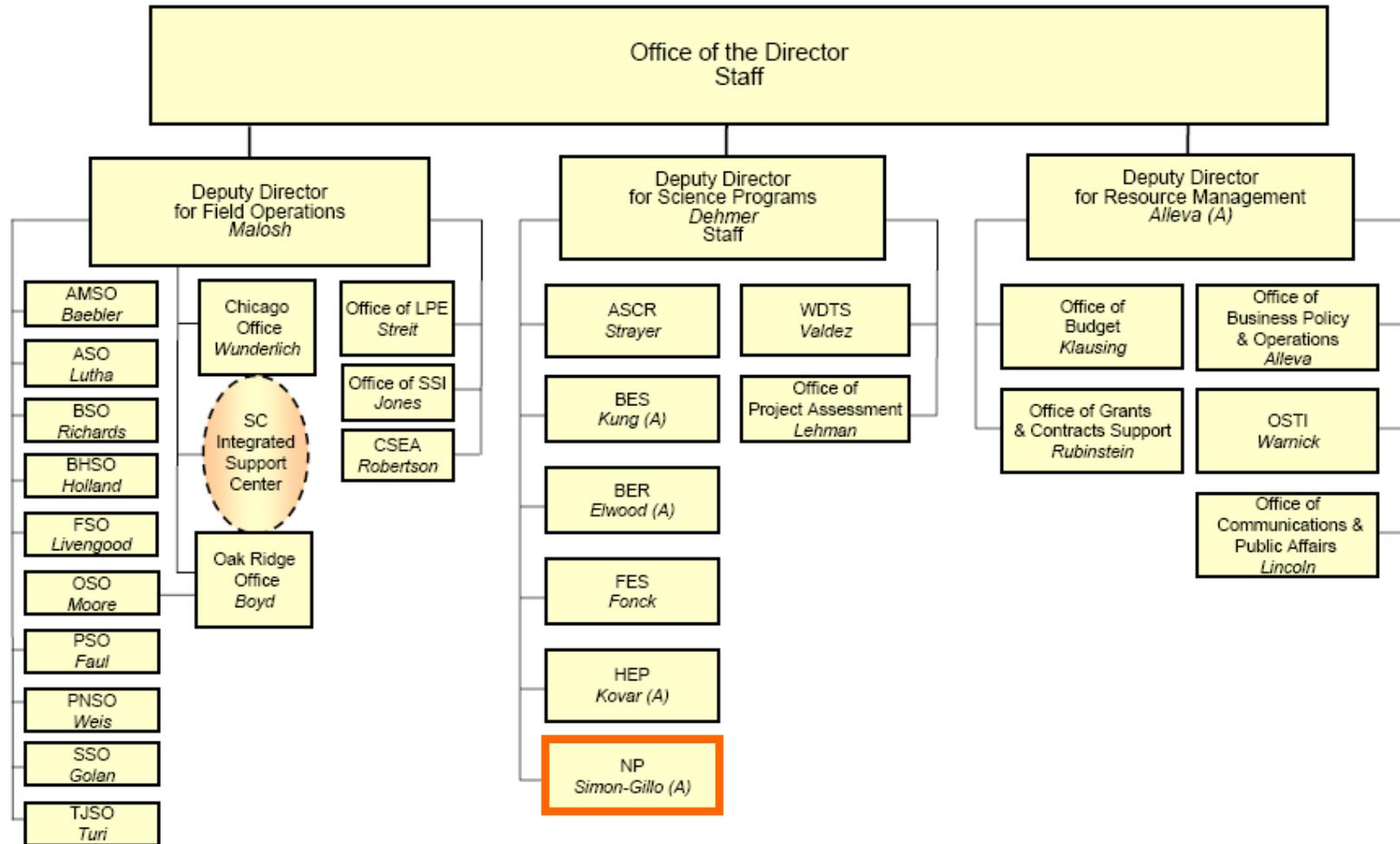
Budget and Facilities

*Presentation to the
Nuclear Science Advisory Committee (NSAC)*

Dr. Raymond L. Orbach
Under Secretary for Science
U.S. Department of Energy
December 3, 2007



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FY 2008 Budget Request Status

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FY 2008 Funding Status

(budget authority in thousands of dollars)

	FY 2007 Approp.	FY 2008					
		Request	Req. vs. 07	House	House vs. Request	Senate	Sen. vs. Request
Basic Energy Sciences	1,250,250	1,498,497	+248,247	1,498,497	—	1,512,257	+13,760
Advanced Scientific Computing	283,415	340,198	+56,783	340,198	—	334,898	-5,300
Biological and Environmental	483,495	531,897	+48,402	581,897	+50,000	605,320 ^a	+73,423
High Energy Physics	751,786	782,238	+30,452	782,238	—	789,238	+7,000
Nuclear Physics	422,766	471,319	+48,553	471,319	—	471,319	—
Fusion Energy Sciences	318,950	427,850	+108,900	427,850	—	427,850	—
Science Lab Infrastructure	41,986	78,956	+36,970	151,806	+72,850	88,956	+10,000
Science Program Direction	166,469	184,934	+18,465	178,290	-6,644	184,934	—
Workforce Development	7,952	11,000	+3,048	11,000	—	11,000	—
Safeguards and Security	70,225	70,987	+762	70,987	—	70,987	—
Total, Science	3,797,294	4,397,876	+600,582	4,514,082	+116,206	4,496,759	+98,883
Less: Earmarks	—	—	—	-70,145 ^a	-70,145	-49,150 ^a	-49,150
Total, Science except earmarks	3,797,294	4,397,876	+600,582	4,443,937	+46,061	4,447,609	+49,733

+11.5%

^a The House report did not specify which program(s) earmarks were to be funded in. Senate earmarks are funded within the Biological and Environmental Research program.



Facilities for the Future of Science: *A Twenty-Year Outlook*



In November, 2003 DOE's Office of Science proposed a portfolio of 28 prioritized new scientific facilities and upgrades of current facilities spanning scientific disciplines to ensure the U.S. retains its primacy in critical areas of science and technology well into the next century.

The choices in the portfolio were limited by fiscal discipline. After other calls on SC funding, the balance of resources according to the congressionally authorized amounts were devoted to facilities. The authorized numbers were very close to President Bush's American Competitiveness Initiative for the Office of Science (doubling over 10 years).

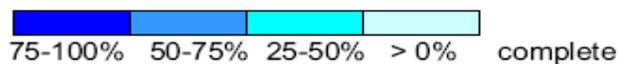
The *Facilities for the Future of Science: A Twenty-Year Outlook* was the first long-range facilities plan prioritized across disciplinary lines ever issued by a government science funding agency anywhere in the world.

Significant progress has been made in implementing the plan and deploying many of the planned facilities.

We have finished an update on where we are at now in 2007.

Status of Facilities For the Future: 20-Year Outlook – By the end of FY 2008

				R&D	Conceptual Design	Engineering Design	Construction	Operation
Priority	Program	Facility						
1	FES	ITER		75-100%	75-100%	75-100%	75-100%	75-100%
2	ASCR	UltraScale Scientific Computing Capability		75-100%	75-100%	75-100%	75-100%	75-100%
Tie for 3	}	HEP	Joint Dark Energy Mission	25-50%				
		BES	Linac Coherent Light Source	75-100%	75-100%	75-100%	75-100%	
		BER	Protein Production and Tags → Bioenergy Research Centers*	75-100%	75-100%	75-100%	75-100%	
		NP	Rare Isotope Beam Facility (previously RIA) #	75-100%				
Tie for 7	}	BER	Characterization and Imaging → Bioenergy Research Centers*	75-100%	75-100%	75-100%	75-100%	75-100%
		NP	CEBAF Upgrade	75-100%	75-100%	75-100%	75-100%	
		ASCR	ESnet Upgrade	75-100%	75-100%	75-100%	75-100%	
		ASCR	NERSC Upgrade	75-100%	75-100%	75-100%	75-100%	
		BES	Transmission Electron Aberration Corrected Microscope	75-100%	75-100%	75-100%	75-100%	
12	HEP	BT eV #		Terminated				
13	HEP	International Linear Collider		25-50%				
Tie for 14	}	BER	Analysis/Modeling of Cellular Systems → Bioenergy Research Centers*	75-100%	75-100%	75-100%	75-100%	75-100%
		BES	SNS 2-4 MW Upgrade	25-50%				
		BES	SNS Second Target Station	25-50%				
		BER	Whole Proteome Analysis → Bioenergy Research Centers*	75-100%	75-100%	75-100%	75-100%	
Tie for 18	}	NP/HEP	Double Beta Decay Underground Detector	25-50%				
		FES	Next-Step Spherical Torus	25-50%				
		NP	RHIC II	25-50%				
Tie for 21	}	BES	National Synchrotron Light Source Upgrade*	75-100%	75-100%	75-100%	75-100%	
		HEP	Super Neutrino Beam	25-50%				
Tie for 23	}	BES	Advanced Light Source Upgrade	25-50%				
		BES	Advanced Photon Source Upgrade	25-50%				
		NP	eRHIC or eLIC or Electron Ion Collider	25-50%				
		FES	Fusion Energy Contingency	25-50%				
		BES	HFIR Second Cold Source and Guide Hall	25-50%				
		FES	Integrated Beam-High Energy Density Physics Experiment	25-50%				



*Technology readiness changed
Changed due to planned facility abroad



Status of Nuclear Physics Facilities

CEBAF 12 GeV Upgrade

- The 12 GeV Upgrade at the Continuous Electron Beam Accelerator Facility at TJNAF will maintain unique capabilities in polarized electron beam studies of the quark structure of the nucleon beyond the next decade.
- **Critical Decision 2 (CD-2)** – Approve Performance Baseline completed November 2007.
- R&D and Project Engineering and Design (PED) planned for FY 2008.

RHIC

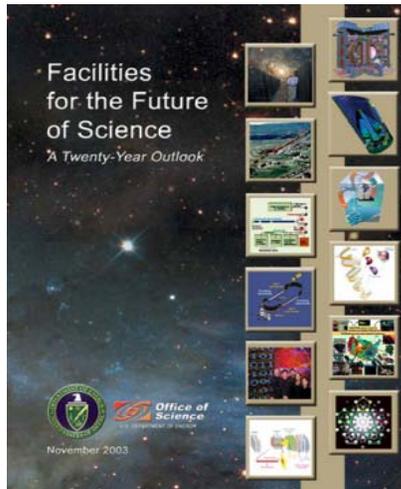
- The Relativistic Heavy Ion Collider at Brookhaven continues world-leading studies of hot, dense nuclear matter and the origin of the proton spin.
- Modest upgrades to two major detectors, STAR and PHENIX continue.
- Future upgrade (RHIC II) will provide a tenfold increase in beam luminosity. The pace of R&D suggests the RHIC II project will be in a position to start construction within the next five years.

Facility for Rare-Isotope Beams

- With valuable guidance from NSAC, the National Academy, and the scientific community, a path forward has been identified for a world-class U.S. facility for rare-isotope beams that provides outstanding scientific opportunities and complements capabilities elsewhere.
- R&D on rare-isotope beam development relevant to next-generation facilities in nuclear structure and astrophysics continues in FY 2008; initiation of a solicitation for design of a next-generation U.S. facility planned.



Comparing Facilities Portfolio With Europe's Roadmap



DOE Science plan

- Is a “bottoms up” & “top down” approach
- Includes prioritization across fields of science
- Fiscal discipline resulted in 28 facilities “making the cut”
- While some facilities are international, most would be entirely funded by the U.S.



ESFRI Roadmap

- Is not a priority list
- Aim is to facilitate discussion to allow for coherent planning
- 35 facilities made the cut
- Each facility supported by at least one European Member and has great potential at pan-European level



European Roadmap for Research Infrastructures, Report 2006 (pg.8-9)

Astronomy, Astrophysics, Nuclear and Particle Physics

Projects	Estimated Construction Cost (M€)	Operations	Description
ELT: The European Extremely Large Telescope	850	2018	European Extremely Large optical telescope
FAIR	1186	2014	Facility for Antiproton and Ion Research
KM3NET	220-250	2015	Underwater Neutrino Observatory (in design phase)
SKA: The Square Kilometre Array (GLOBAL)	1150	2014-2020	Square Kilometer Radiotelescope Array (in two phases)
SPIRAL2	137	2011	Production and study of rare isotope Radioactive beams (toward the future facility EURISOL)*

* EURISOL, European Isotope Separator On-Line facility



Capabilities of FRIB

- Additional nuclei from FRIB

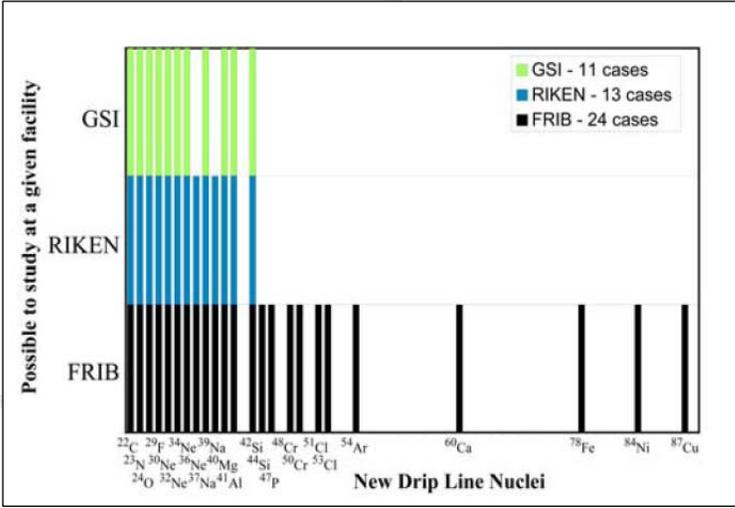
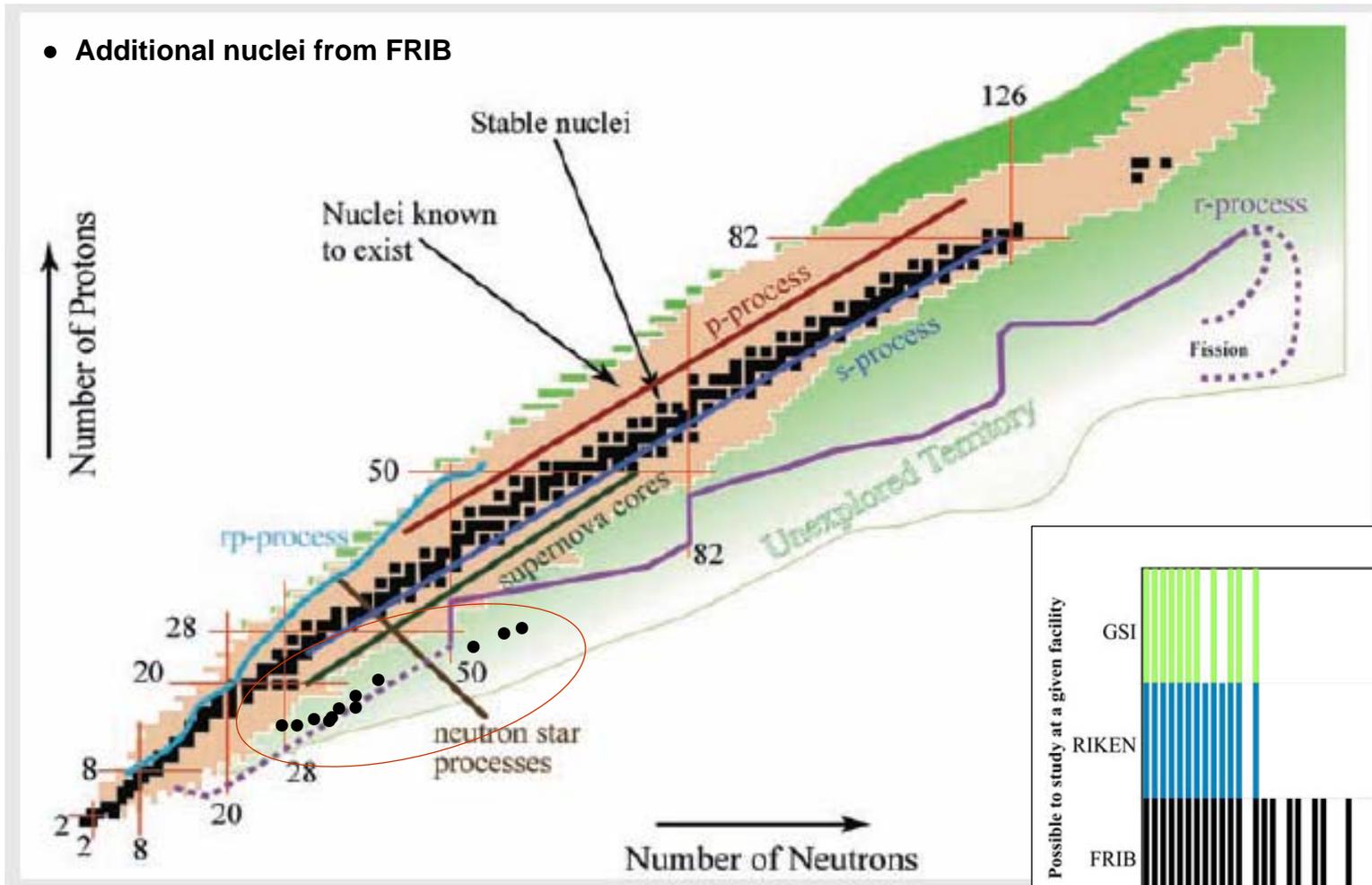


Chart of Nuclides, nuclei as a function of number of number of neutrons and Protons they contain.



Summary

From the new draft NSAC Long Range Plan:

“Implementing the four principal recommendations of this Plan can be accomplished with a funding profile consistent with doubling the DOE’s Office of Nuclear Physics budget, in actual year dollars, over the next decade....”

Facilities for the Future: 20-Year Outlook (NP):

Tie for 3: Facility for Rare Isotope Beams

Tie for 7: CEBAF Upgrade

Tie for 18: Double Beta Decay Underground Detector

Tie for 18: RHIC II

Tie for 23: eRHIC or eLIC or Electron Ion Collider

Funding increase from FY 2006 to FY 2007 (actual): +15.2%

Funding increase from FY 2007 (actual) to FY 2008 (requested): +11.5%